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(51) Title of the utility model design: Air Cleaner with a built in honey comb element having a conical part

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(72) Designer of utility model: Yoshitaka Morita
645 - 4, Kumagawa, Fussa- shi
(72) Designer of utility model: K. Suzuki
569 – 3, Shimo akasaka, Kawakoshi- shi
(71) Applicant : **TSUCHIYA MFG CO LTD**
4- 6- 3, Higashi Ikebukuro, Toyojima – ku, Tokyo, Japan

Detailed description

1. **Title of the utility model design: Air Cleaner with a built in honey comb element having a conical part**

2. **Claims made by the utility model**

An air cleaner with a built in honey comb element that consists of a conical part and which is characterized by a raw material consisting of a plane shaped board or a corrugated board inclining in the longitudinal direction that is first stacked up and is then laminated by coiling (winding) from the wider side around the coiling core, the terminal of the above mentioned material is fixed after which, a cylindrical honey comb element that comprises of a conical part as a sealing closed end alternating between the raised part on one end (mountain) and the depressed part on the other end (valley), is formed. Further, the said element is housed in a cylindrically shaped body that consists of an inlet and outlet pipe.

3. **Detailed Explanation of the Utility model**

This design model is related to an air cleaner with a built in honeycomb element and in particular, pertains to improvements in the shape of the honeycomb element.

Drawing 1 a vertical cross sectional drawing of the air cleaner A housing the honeycomb element E and is a diagram that is used to explain the prior examples. The honey comb element E is wound or coiled around the core F after having piled on (stacked up) plane surfaced board material G and the corrugated board material H.

Subsequently, the raised part at one end and the lowered (depressed) part on the other end are alternately sealed following which the open end J and the closed end K are formed. Further, this is housed within the cylindrically shaped body B that is connected to the inlet pipe C and the outlet pipe D. Sealant parts (stoppers) L_1 and L_2 are used to prevent or stop an air leak in the external circumference of the honeycomb element E and the inner side of the body B and further, the honey comb element E and the body B are fixed. As has been indicated in the drawing, the honey comb element E is found to be longitudinal in its cross section and moreover, a passage channel M consisting of an alternating open end J and a closed end K is formed within the honey comb element and the air that flows in from the inlet pipe C passes through from the open end J of the side of the inlet pipe C into the passage channel M in the shape of an arrow and is collected <illegible> when the air flows out of the open end J of the outlet pipe D. Only the clean air will be absorbed into the engine (this has not been shown in the drawing) from the outlet pipe D. However, in the case of the conventionally used air cleaner A, the air that flows in from the inlet pipe C could easily start to create turbulence before entering into the honey comb element E. In addition, the velocity of air flow within the passage channel M that is close to the body B and the velocity within the passage channel M that is close to the core F is not uniform with the speed (velocity) of air flow close to the side of the core F being greater and thus, there is an inequality in the velocity of air flowing from the passage channel M in the honey comb element E.

Moreover, the total surface area of the passage channel M (<*illegible*> area) is determined by the length of the latitudinal direction of the honey comb element E and the total surface area is found to be small thereby being responsible for a defect in this design, namely a shorter life span.

This design was developed in order to overcome the above mentioned defect; the model not only aims at making the flow velocity (speed) uniform within the honey comb element E but also focuses on the lengthening of the life span of the honey comb element through the total surface area. The model is characterized by a raw material consisting of a plane shaped board or a corrugated board inclining in the longitudinal direction that is stacked or piled up which is then laminated by coiling (winding) from the wider side around the coiling core, after which a cylindrically shaped honey comb element that comprises of a conical part in the said area is formed with the said element being housed in a cylindrically shaped body that consists of an inlet and outlet pipe. The working examples of this model are explained below by means of the drawings.

Drawing 2 (a) is a partial cross sectional diagram that is used in order to explain the improved honey comb element 4 that was located within the body 1 used in the conventional examples.

The honey comb element 4 uses a plane surfaced board or a corrugated board material with only its top portion inclined as has been shown for example, in Drawing 2 (b) with a starting width of H_1 and an ending width of H_2 (however, over here H_1 is larger) and stacks up these board materials,

which then coils (winds) from the wider side in the long coiling core 5, fixed the terminal ends and, similar to the previously used product, is a cylindrically shaped object that forms the conical part 7 as a sealing closed end alternating between the raised part on one end (mountain) and the depressed part on the other end (valley); Drawing 2 (c) shows an inclined view of the same. 2 is the inlet pipe, 3 is the outlet pipe while 8 and 9 are the sealing parts (stoppers) and body 1 and the honey comb element 4 are fixed at the positions of the sealing parts 8 and 9.

In the case of the above mentioned air cleaner 10, the air flowing in from the inlet pipe 2 has its flow controlled by the conical part 7 which plays the role of an air guide bringing it closer to a laminar flow and since the distance between the passage 6 in the vicinity of the coiling core 5 now becomes lengthened, the resistance is now found to be greater thereby leading to a reduction in the flow speed. This now results in the equalization of the flow speeds within the passage channels of the honey comb element 4 and, with an increase in the total surface area of the conical part alone, there will be a larger collection amount of <illegible> and consequently a lengthening in the life span of the element.

Drawing 3 shows the honey comb element 4 consisting of the inlet and outlet pipes as well as the conical part in a state that is the reverse of what is displayed in Drawing 2 (a).

Drawing 4 shows the conical part which has been set up at both ends of the cylindrically shaped honey comb element and, similar to Drawing 4 (b),

is found to be inclined both in the upper and the lower areas while forming the honey comb element with the wider side H_3 and the narrower side H_4. Further, even in the case when the inlet and the outlet pipes are at right angles to axial center of the honey comb element, it is found to be effective with regards to the equalization of flow speed with the element and the lengthening of the life span.

Drawing 5 is a cross sectional diagram that is used to explain the inlet and the outlet pipes that are located in the honey comb element with conical parts on both sides and in the same axis and here the flow of the honey comb element's flow passage can be made uniform even more easily and it is found to be superior with respect to the length of its life as well.

Drawing 6 is a vertical cross sectional drawing used to explain or give an outline of the air cleaner 20 with a built in honey comb element 14 consisting of a conical part 17, this air cleaner is also referred to as an inline cyclone.

The center of one end of the cylindrically shaped body 11 formed the closed end and its vicinity is found to contain an inlet portion 12 that is equipped with a louver 15, and further, the guide 16 is set up such that it is almost parallel to vertical angle of the above mentioned conical part 17 from the inner circumference of the louver 15. Moreover, in the outer circumference of the honey comb element 14 that is in the vicinity of the outlet pipe 13,

for example, a steel board is wound or coiled around to form the element guide 18 and a *<illegible >* discharge equipment 21 is provided in its lower area. (The discharge equipment / device 21 is normally formed using the collection pipe 19 and the valve 22).

In the case of this air cleaner 20, particles with a coarse granular diameter are collected and discharged into the discharge equipment 21 through the centrifugal action of the louver 15, the guide 16 and the element guide 18. Further, those particles with the coarse granular diameter that are not centrifugally separated are purified and cleaned in the honey comb element 14 with the conical part 17 and only clean and pure air is absorbed in the engine (this has not been shown in the drawing).

As has been explained here with the help of many working examples, this design model has a honey comb element with a longitudinal cross section with a conical part provided on one or both ends which is housed within a body consisting of each of the inlet and outlet pipes and, since equalization in the flow speed of air within the honey comb element as well as enlargement of the total surface area have been achieved, there is no increase in the initial air flow resistance thereby leading to a lengthening of the life span of the element.

4. Brief Explanation of the drawings

Drawing 1 is a vertical cross sectional diagram that is used to explain the conventional working example,

Drawing 2 (a) is a partial cross sectional drawing that is used to explain the working of this model's element housed in the conventionally used body, Drawing 2 (b) is a plane diagram used for the purpose of explaining the materials used in the model while Drawing 2 (c) is an inclined view of the element. Drawing 3 is a cross sectional diagram reversing Drawing 2 (a) and Drawing 4 (a) is a cross sectional diagram of the use example of the element with the conical part on both ends. Drawing 4 (b) is a plane diagram used to explain the materials used while Drawing 5 is a cross sectional diagram of the coaxial example and Drawing 6 is a vertical cross sectional figure used to explain other working examples.

1, 11, B	Body	2, C	Inlet pipe
3, 13, D	Outlet pipe		
4, 14, E	honey comb element		
5 , F	coiling core		
7, 17	Conical part		
10, 20, A	Air cleaner		

Utility model application registration applicant: Tsuchiya Manufacturing Company Ltd.

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Drawing 1

Drawing 2 (a)

Drawing 2 (c)

Drawing 2 (b)

Drawing 3

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Drawing 4

(a) (b)

Drawing 5

Drawing 6

Utility model application registration applicant: Tsuchiya Manufacturing Company Ltd.

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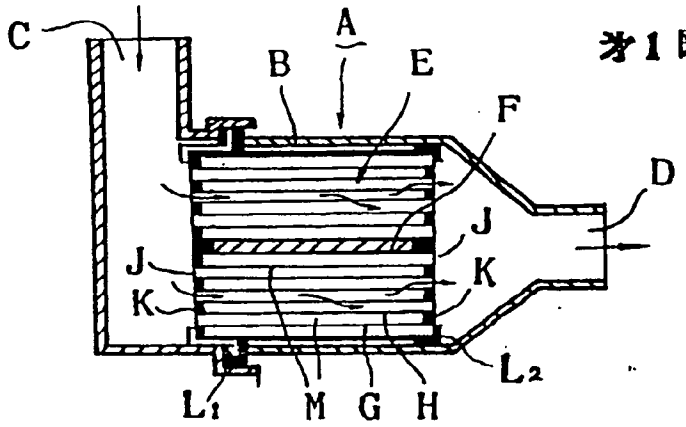
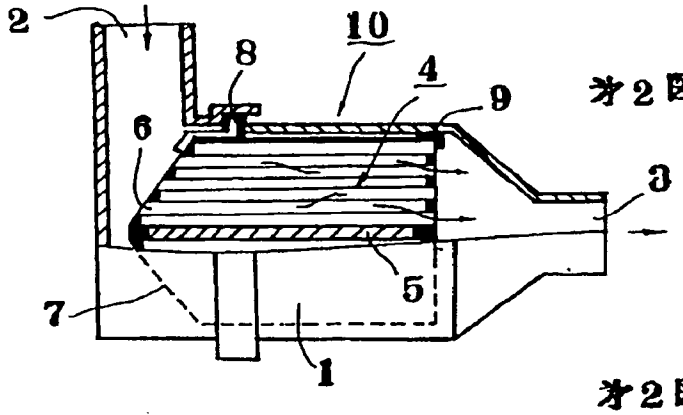
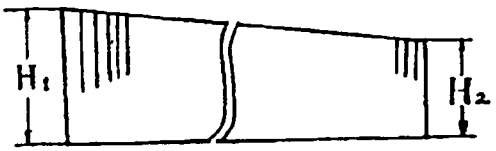


第1図



第2図(イ)

第2図(ロ)



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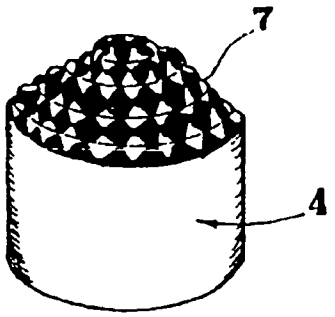
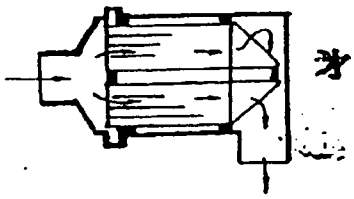
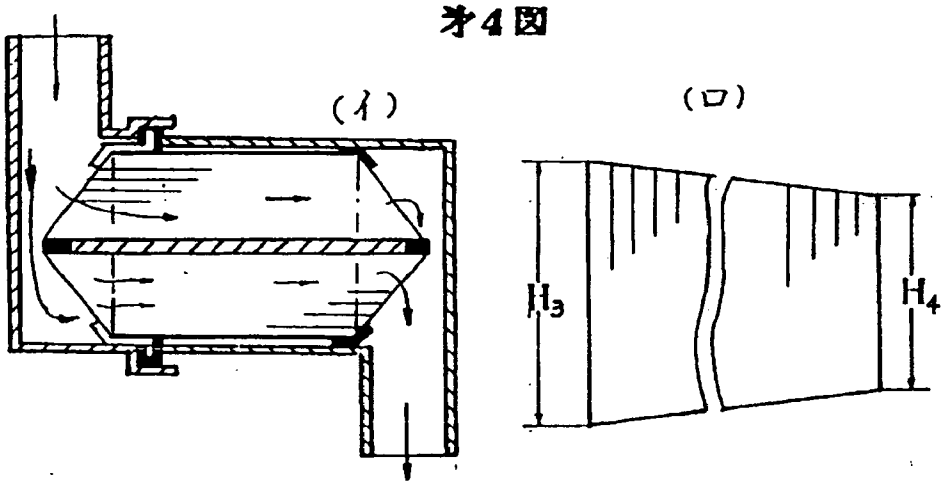




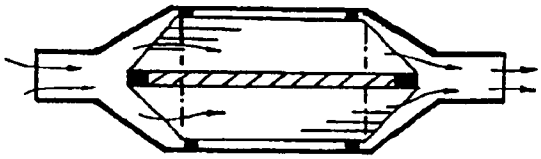
第3図

実用新案登録出願人　株式会社土屋製作所

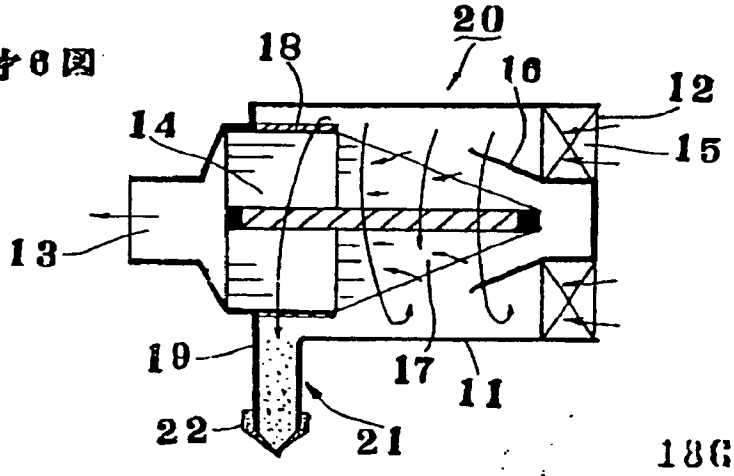
第4図



第5図



第6図



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実用新案登録出願人　株式会社土屋製作所

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⑤Int.Cl.⁴	識別記号	庁内整理番号	㊸公開　昭和60年(1985)7月30日
B 01 D 46/00		7636－4D	
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審査請求　未請求　（全　頁）

㊹考案の名称　円錐部を有するハニカムエレメント内蔵のエアクリーナ

㉑実　願　昭58－201912

㉒出　願　昭58(1983)12月28日

㉓考案者　森田　佳孝　福生市熊川645－4

㉓考案者　鈴木　光俊　川越市下赤坂569－3

㉑出願人　株式会社　土屋製作所　東京都豊島区東池袋4丁目6番3号

明　　細　　書

1.考案の名称

円錐部を有するハニカムエレメント内蔵のエアクリーナ

2.実用新案登録請求の範囲

長手方向に傾斜した平板状および波板状の沪材を、重ね合わせて巻芯に広幅側より巻層し、前記沪材の終端を止着し、一端の山部と他端の谷部とを交互にシール閉端として円錐部を有する円筒状のハニカムエレメントを形成し、該エレメントを入、出口管を有する円筒状のボディに内蔵することを特徴とする円錐部を有するハニカムエレメント内蔵のエアクリーナ。

3.考案の詳細な説明

本考案は、ハニカムエレメント内蔵のエアクリーナ、特にハニカムエレメントの形状の改良に関する。

第1図は、従来例のハニカムエレメントEを内蔵したエアクリーナAの説明用縦断面図を示す。ハニカムエレメントEは平板状沪材Gと波

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板状沪材Hとを重ねて巻芯Fに巻層し、一端の山部と他端の谷部とを交互にシールして開端J、閉端Kを形成したものである。そして入口管C、出口管Dに接続する円筒状のボディB中に収納し、密閉部L_1、L_2でハニカムエレメントEの外周とボディBの内側の大気洩れを防止し、そしてハニカムエレメントEとボディBは固定されている。図示のようにハニカムエレメントEは断面が長方形でその中に交互に開、閉端J、Kを有した流路Mが形成され、入口管Cから流入する含塵エアは入口管C側の開端Jより流路Mを矢印のように通過し出口管D側の開端Jから流出する間に塵埃は捕集され、清浄なエアのみが出口管Dから図示しないエンジンへ吸引される。しかしながら従来のエアクリーナAのような場合、入口管Cから流入するエアは、ハニカムエレメントEに流入する前に乱流になりやすく、かつ巻芯Fに近い流路M内とボディBに近い流路M内の流速は巻芯F側の方が速くハニカムエレメントE内の流路Mを流れるエアの流速

は不均一で、さらに流路Mの総面積（沪過面積）はハニカムエレメントEの軸方向長さで決まり沪過面積が小で塵埃の保持量すなわち寿命が短かいという欠点がある。

本考案はこの欠点を解消するためのもので、ハニカムエレメント内の流速を均一化するとともに沪過面積増によりハニカムエレメントの寿命を延長せんとするものであり、長手方向に傾斜した平板状および波板状の沪材を、重ね合わせて巻芯に広幅側より巻層し、前記要領で円錐部を有する円筒状のハニカムエレメントを形成し、入、出口管を有する円筒状のボディ内蔵固定するようにしたものであり、以下実施例を図面により説明する。

第2図（イ）は従来例に用いたボディ1内に改良したハニカムエレメント4を内蔵したものの説明用一部断面図である。

ハニカムエレメント4は、始端の幅H_1、終端の幅H_2（但しこの合H_1の方が大）で例えば第2図（ロ）に示した上方のみ傾斜した平板状およ

び波板状の戸材を重ね合わせて、長い巻芯5に広幅側より巻層、終端を止着し従来品同様一端の山部と他端の谷部とを交互にシール閉端として円錐部7を形成するようにした円筒状のもので、第2図（ハ）はその斜視図を示したものである。2は入口管、3は出口管、8、9は密閉部でありボディ1とハニカムエレメント4は密閉部8、9の位置で固定されている。

上記エアクリーナ10の場合、入口管2より流入するエアは円錐部7がエアガイドの役目をして流れを層流に近付け、巻芯5周辺の流路6は距離が長くなるので、その分、抵抗が高くなって流速が遅くなり、ハニカムエレメント4内の流路の流速が均一化し、また円錐部の分だけ戸過面積が増加することで塵埃の捕捉量の増、すなわち寿命が延長する。

第3図は入、出口管、および円錐部を有するハニカムエレメント4を第2図（イ）と逆にした状態のものである。

第4図（イ）は円筒状のハニカムエレメント

[redacted]

Aの両側に円錐部を設けるようにしたもので、第4図（ロ）のように、図で上下同傾斜をし広幅側H_1、狭幅側H_2を前記要領でハニカムエレメントを形成させたもので、入、出口管はハニカムエレメント軸心に対し直角程度の角度を有した場合でも、エレメント内の流速均一化、寿命延長に有効である。

第5図は入、出口管が、両側に円錐部を有するハニカムエレメントと同軸に内蔵された説明用断面図で、ハニカムエレメント流路の流れが最も均一化し易く、寿命的にも優れている。

第6図は、いわゆるインラインサイクロンと称されるエアクリーナ20に円錐部17を有するハニカムエレメント14を内蔵した説明用縦断面図で概要を説明する。

円筒状のボディ11の一方端の中央は閉部をなし、その周辺にはルーバ15を備えた入口部12があり、ルーバ15内周から前記円錐部17の頂角とほぼ平行にガイド16が設けられている。また出口管13近傍のハニカムエレメント14の外周には

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例えば鉄板を巻いてエレメントガイド18をなし、その下方部には塵埃の排出装置21が装着されている。（排出装置21は通常集塵管19とバルブ22により形成されている。）

このエアクリーナ20の場合は粗粒径の塵埃はルーバ15、ガイド16およびエレメントガイド18の遠心作用で排出装置21に集塵、排出される。そして遠心分離されない微粒径の塵埃は円錐部17を有するハニカムエレメント14で浄化され清浄なエアのみが出口管13を経て図示しないエンジンに吸引される。

以上多くの実施例を用いて説明したように、本考案は断面が長方形のハニカムエレメントの片側又は両側に円錐部を設け、各種の入、出口管を有するボディに内蔵し、ハニカムエレメント内のエアの流速の均一化と沪過面積を大にしたので初期の通気抵抗を増加することなくエレメントの寿命延長の効果をもたらす。

4．図面の簡単な説明

第1図は従来例の説明用縦断面図、第2図

（イ）は従来ボディに本考案のエレメント内蔵の説明用一部断面図、第2図（ロ）は沪材の説明用平面図、第2図（ハ）はエレメントの斜視図、第3図は第2図（イ）の逆使用断面図、第4図（イ）は両側円錐部エレメントの使用例の断面図、第4図（ロ）はその沪材の説明用平面図、第5図は同軸例の断面図、第6図は他の実施例の説明用縦断面図。

1、11、B……ボディ　　2、C……入口管

3、13、D……出口管

4、14、E……ハニカムエレメント

5、F……巻芯　　7、17……円錐部

10、20、A……エアクリーナ

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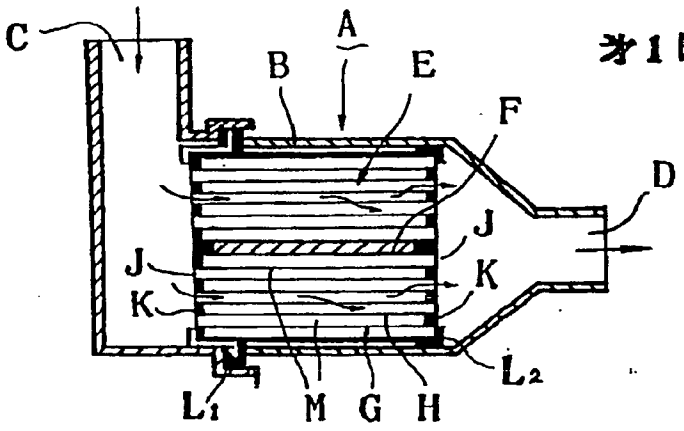
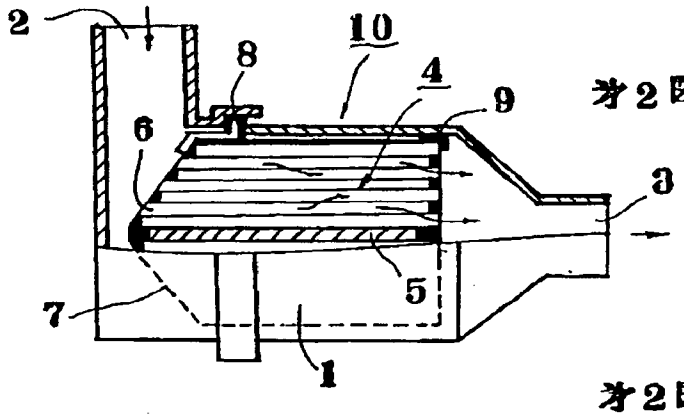
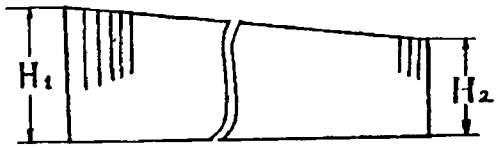


第1図

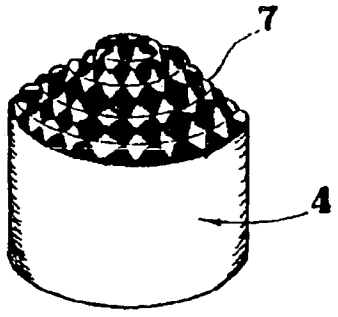


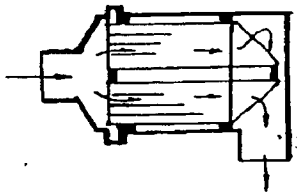
第2図(イ)

第2図(ロ)



第2図(ハ)

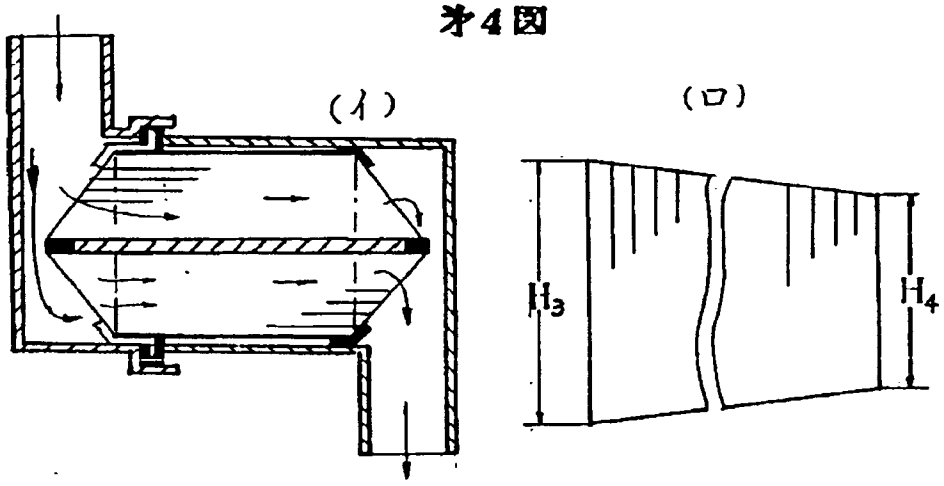




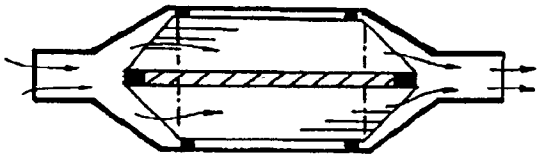
第3図

実用新案登録出願人　株式会社土屋製作所

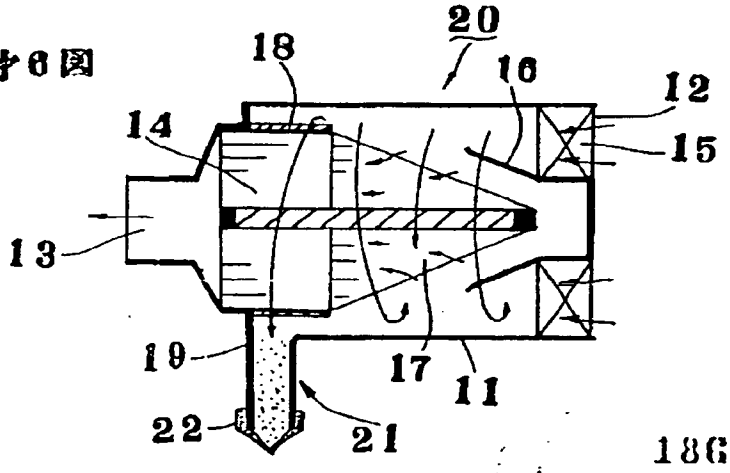
第４図



第５図



第６図



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実用新案登録出願人　株式会社土屋製作所